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ABSTRACT

At a 2-day meeting in November 1984, the Library of Congress Network Advisory Committee (NAC) discussed the information economy in the United States and its effect on libraries and library networks. Material presented at the meeting is included in the form of summaries of three papers on the program theme presented by Ronald F. Miller, Kenneth W. Leeson, and Brett Butler; an edited transcription of "Concrete Example of Using Tools and Techniques" by Michael J. Turillo, Jr., which is a discussion of the need for strategic planning by libraries; and the full text of the papers "Analyzing the Information Economy--Tools and Techniques" (Sherman Robinson) and "The Need to Study Library Economics" (Martin M. Cummings). A summary of the group discussions which followed each of the presentations is also provided. In addition to the report of the meeting, a list of NAC attendees, a summary of the business session, and the conference schedule are included. The text is supplemented by several tables and graphs. (KM)

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NETWORK PLANNING PAPER NO. 10

The Information Economy in the U.S.: Its Effect on Libraries and Library Networks

Proceedings of the
Library of Congress Network Advisory Committee Meeting
November 14-16, 1984

Network Development and MARC Standards Office
Library of Congress
Washington

1985

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FOREWORD

The Library of Congress Network Advisory Committee devoted its November 14-16, 1984 program session to the topic of the information economy in the United States and its effect on libraries and library networks. Invited speakers set the stage for the meeting deliberations. Presentations included a tutorial on the information economy, an introduction to the tools and techniques to measure the information economy, a report on the Information Industry Association study of the information economy, concrete examples of how to use tools and techniques, and a review of the Council on Library Resources' sponsored meeting on the economics of research libraries.

I gratefully acknowledge the efforts expended by the Program Planning Committee, Barbara M. Robinson, chair, Brett Butler, Lois Ann Colaianni, Ronald F. Miller and Laima Mockus to make the meeting a success. In addition, I express my appreciation to Barbara M. Robinson for preparing both the introduction and the report of the group discussions and to Sigrid G. Harriman for taping the session and, with the assistance of Josephine S. Pulsifer, finally putting the various pieces together into one cohesive whole.

This document has been issued as proceedings of the Network Advisory Committee meeting within the Library of Congress Network Planning Papers series. In the interest of time, those presentations submitted as completed papers were not retyped for consistency and format. For this reason, the footnotes in the Introduction and in each report or paper are numbered separately beginning with no. 1. The opinions expressed in the proceedings are those of the speakers and do not necessarily represent the opinions of their organizations.

Henriette D. Avram
Chair, Network Advisory Committee

May 31, 1985

ATTENDEES

Organizations	Representatives
American Library Association	Carol C. Henderson
American Society for Information Science	Ward Shaw
AMIGOS Bibliographic Council	Louella V. Wetherbee
Association of American Publishers	Sandra K. Paul
Association of Research Libraries	William J. Studer
Bibliographical Center for Research	David H. Brunell
Chief Officers of State Library Agencies	Anthony W. Miele
Cooperative Library Agency for Systems and Services	Ronald F. Miller
Council on Library Resources	Dr. Martin M. Cummings
Federal Library and Information Center Committee	James P. Riley
Information Industry Association	Brett Butler
Institute for Scientific Information	Not represented
Library of Congress	Henriette D. Avram
Medical Library Association	Erika Love
Minnesota Interlibrary Telecommunications Exchange	Not represented
National Agricultural Library	Pamela Q. Andre
National Commission on Libraries and Information Science	Toni Carbo Bearman
National Federation of Abstracting and Indexing Services	James L. Wood
National Library of Medicine	Lois Ann Colaianni
NELINET, Inc.	Laima Mockus

Organizations	Representatives
OCLC, Inc.	Mary Ellen Jacob
Research Libraries Group, Inc.	C. James Schmidt
Southeastern Library Network	Frank P. Grisham
Special Libraries Association	Barbara M. Robinson
University of Chicago	Charles T. Payne
Washington Library Network	Roderick G. Swartz
Observers	
Information Industry Association	Betty Davis
Institute for Scientific Information	Morton Malin
Library of Congress	Olive C. James Carol Nemeyer Donald P. Panzera Lucia J. Rather Robert C. Sullivan Susan M. Tarr
National Commission on Libraries and Information Science	Diane Yassenoff Rafferty
Universal Serials & Book Exchange, Inc.	Mary W. Ghikas
Other	
Library of Congress Network Advisory Committee, Secretariat	Sigrid G. Harriman

INTRODUCTION

In November 1984, the Library of Congress Network Advisory Committee (NAC) met in Washington, D.C. and devoted two days to the subject of "The Information Economy in the U.S.: Its Effect on Libraries and Library Networks." Why did NAC choose to spend so much time on such a technical subject? The answer is that the NAC member institutions and organizations are part of the information economy—both as consumers and producers. None of us, however, were clear about the definition of the information economy. We wanted to know what was counted as part of the information economy and how libraries were classified. We shared John Naisbitt's concern, expressed in Megatrends: "If we are to speak of the information economy, we must be able to measure it in concrete terms."[1]

Many of us had heard the often quoted statistic that nearly half of the income generated in the economy is attributable to information products and services. And a few of us had tackled the two seminal studies on the information economy, one conducted by Fritz Machlup in 1962[2] and updated in 1980,[3] and the other by Marc Porat in 1977.[4] We all agreed that we wanted to understand in more quantitative terms what factors were causing the shift in the structure of the economy from an industrial to an information society. How should our institutions adjust to and capitalize on these structural changes?

Our deliberations on the topic were preceeded by two other related meetings, both of which were reported on during the course of the program session. Ronald F. Miller gave a brief summary of the meeting held in March 1984 by the California State Library as an invitational conference, coordinated by the Graduate School of Library and Information Science at the University of California, Los Angeles (UCLA), on the topic "Libraries and the Information Economy of California." Fifty participants met for three days at the UCLA Lake

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(1) John Naisbitt, Megatrends. (New York, N.Y.: Warner Books, 1982), p. 11-12.

(2) Fritz Machlup, The Production and Distribution of Knowledge in the United States. (Princeton, N.J.: Princeton University Press, 1962).

(3) Fritz Machlup, Knowledge and Knowledge Production. (Princeton, N.J.: Princeton University Press, 1980).

(4) Marc Uri Porat, The Information Economy, by Marc Uri Porat with the assistance of Michael Rogers Rubin. (Washington, U.S. Dept. of Commerce, Office of Telecommunications, 1977). 9v. OT Special Publication, 77-12.

Arrowhead Conference Center to listen to speakers and to deliberate on how to harness and make more visible the information resources and services in the state of California. They explored a number of public policy issues relating to the question of how to value information provided to and by the public and the private sectors. As Gary Strong, the State Librarian of California, put it in an interview after the conference: "We need to understand what society is going to be like when information becomes viewed as a commodity. We need to have thought out how libraries should be restructured. Libraries need to take a leadership role. Librarians must define the public good to include what we do. We have been too passive about our future. Libraries sit on mountains of objective information which librarians organize beautifully but fail to interpret."[5] Mr. Strong's impatience with our lack of interest in making the mountains of information work for us is echoed in the introduction to the workbook prepared for the California conference. The essay states that "All of these [issues] require that the managers and policy makers concerned with the information of the state have adequate data on which to base their decisions."[6]

The concern at the Arrowhead Conference about the need for adequate data was mirrored in a later meeting with a different audience on a related topic. In early November 1984, the Council on Library Resources (CLR) sponsored a meeting in Washington, D.C. on the economics of research libraries. Dr. Martin M. Cummings reported on the meeting during the NAC program session.

At the NAC meeting, Dr. Cummings lamented the paucity of library statistics, stressing that few library statistical compilations provide cost data that can be used for planning or forecasting. He also emphasized the need to gather data on new cost categories. While nearly every library can report on the cost of binding, few had readily available information on the cost of automation. Dr. Cummings reported on the results of a test data collection effort by the Association of Research Libraries (ARL). Thirteen ARL libraries, stimulated by CLR's concerns about inadequate library cost information, gathered data in six new cost categories including the costs of automation, e.g., bibliographic utility charge, database searching charges, hardware and software expenditures.

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(5) Barbara M. Robinson, chair of the NAC program session on the information economy, interviewed Gary Strong at the State Library in Sacramento in the fall of 1984. She alluded to his remarks during the course of the NAC program session.

(6) University of California, Los Angeles, Graduate School of Library and Information Science, "Libraries and the Information Economy of California: Public Policy Issues and Needed Research." Workbook for an invitational conference held at the UCLA Lake Arrowhead Conference Center, March 18-21, 1984.

In a paper which Dr. Cummings prepared on "The Need to Study Library Economics," which is included as part of the presentations of the program session, he speculated on some of the reasons why libraries have had inadequate statistics and therefore have not been able to engage in the kind of planning and forecasting that good statistics support. He observed that "Some libraries have considered library statistics a necessary chore for membership in selective professional associations rather than as a tool for management decisions. More recently, however, librarians have begun to use statistics to make budget comparisons with institutions of similar size and characteristics." Later in the paper, he goes on to say: "The collection of library cost data has been inhibited by some librarians' fear that the analysis of findings might lead to further decreases in their budgets. . . . More recently, leading librarians have recognized that library cost data may not be embarassing but could, in fact, help support their requirements for increasing budgets. Some also have recognized that intelligent decision making requires cost data to assist in monitoring current performance and forecasting future trends."

These same concerns were expressed by the NAC members as well. All agreed that they needed to equip themselves with a vocabulary and a conceptual framework in order to prepare for the future. They wanted to review a number of key economic principles and to learn about the different methodologies that Machlup and Porat used in dissecting the economy. Once the terms for discussion had been established, they could then address such questions as what should be and can be done as a result of digesting all this information, and does a better understanding of what is meant by the information economy and the forces that are driving it improve the ability to position libraries and library networks in the economy?

The chair of the program planning subcommittee enlisted two economists, Kenneth W. Leeson and Sherman Robinson, to provide the vocabulary needed to discuss the information economy, and to present a tutorial on Machlup and Porat, respectively. NAC members needed to understand the difference between Machlup's and Porat's approaches to analyzing the interrelationships in the information economy.

Mr. Robinson discussed the Machlup and Porat approaches and the strengths and weaknesses of each methodology. He spent some time describing the conceptual framework provided by the national income and product accounts (NIPA), and the input output accounts. He urged that we take a careful look behind the numbers in those sectors of the information economy that have shown rapid growth, i.e., at the four to five digit Standard Industrial Classification (SIC) level. A finer level of detail might identify those information industries responsible for the greatest change and provide us with some benchmarks. Libraries would not fall into this category of enterprise, however, since they are such a small sector in the economy that even with a finer breakdown the numbers would be too small to show up in an economy-wide picture. Mr. Robinson said that if we seek that level of detail we will need to supply it ourselves.

At the end of the session Mr. Robinson was asked to write a paper summarizing his verbal presentation and his paper is included in these proceedings.

In order to make concrete the Leeson and Robinson presentations, Brett Butler presented the results of an A.C. Nielsen survey conducted for the Information Industry Association (IIA). The survey was designed to gather data and develop statistics on the structure of the information economy as defined from an IIA perspective.

Mr. Butler underscored the need for, and the current lack of, data generated by the information industry about itself. He said that collecting data about the information industry is tricky because this sector will not stand still; it is evolving so quickly that it is hard to define it. He regretted that libraries had not collected data on the information industries and, since most information companies do not break down their sales by customer categories (or will not report them), there are no data available to measure what kind of market clout libraries have on the information economy. He guessed that libraries are a $2 billion a year sector of the information industry.

Following Mr. Butler, Michael J. Turillo, Jr. discussed the need for strategic planning by libraries. He stressed the importance of acquiring good information in order to make informed plans and decisions. He spoke from the vantage point of his role as a principal with Peat, Marwick, Mitchell and Co. who advises financial institutions on strategic planning. He described how financial institutions were adjusting to the structural shifts in the economy. He said that they have gone from being in the business of handling money to being in the business of handling information. Because libraries and library networks are facing similar dramatic changes, the financial institution analogy was particularly illuminating.

PROGRAM SESSION

The chair of the Library of Congress Network Advisory Committee (NAC) invited the following speakers to participate in this session: Ronald F. Miller, Cooperative Library Agency for Systems and Services (CLASS); Kenneth W. Leeson, U.S. Department of State; Sherman Robinson, Department of Agricultural and Resource Economics, University of California, Berkeley; Brett Butler, Information, Investment & Intelligence Incorporated (Infour); Michael J. Turillo, Jr., Peat, Marwick, Mitchell & Co., and Dr. Martin M. Cummings, Council on Library Resources (CLR).

The proceedings include 1) a summary of the presentations made by Ronald F. Miller, Kenneth W. Leeson, and Brett Butler, 2) Michael J. Turillo's presentation, edited by Mr. Turillo from the tape transcription and further edited for consistency with the proceedings as a whole, and 3) prepared papers by Sherman Robinson and Martin M. Cummings. There has been no attempt made to prepare a verbatim account of the session.

Setting the Stage

The first speaker, Ronald F. Miller, Executive Director of CLASS, presented the results of a survey of NAC members aimed at identifying the three most important trends in the information economy affecting libraries. The responses indicated that the NAC members had difficulties identifying trends. In most instances they had identified topics of interest rather than trends, for example, public/private sector interactions, telecommunication facilities and costs, full text data bases, the proliferation of microcomputers, the information disadvantaged, budget allocation/reallocation, developments in local area networks, fiber optics and the wiring of campus facilities.

Rising telecommunication costs were seen as the driving force behind the interest in distributed, decentralized systems. Respondents expressed concern about information overload—the problem of "junk knowledge"—that presents the challenge of discerning useful information from the noise. They also raised questions about the economics of information—who pays for what, what the implications are of users paying for information, how the sale of information affects the allocation of resources, and whether there is a need to differentiate between commercial and leisure uses. Respondents also raised questions about the trade-offs between user control and the use of intermediaries and the need for professional advice. Mr. Miller identified one trend as the recognition that library staffs need to be qualified and trained in the effective use of new technologies and need to be able to explain them to library users.

Mr. Miller also gave a brief summary of an invitational conference called "Libraries and the Information Economy of California." The conference, which was held at Lake Arrowhead, California, in March 1984, involved a variety of representatives from the library community, universities, high technology industries, state and local governments, information service providers, and business consultants. The conferees concluded that the information sector represented 60 percent of the work force in California, and consequently represented a highly significant social and financial element in the state's economy.

Tutorial on the Information Economy

Kenneth W. Leeson, a special advisor for policy issues at the U.S. Department of State, spoke at some length on the landmark studies of the information economy by Fritz Machlup and Marc Porat (with Michael R. Rubin).[1] He also discussed a recent but yet to be published update by Rubin of the Porat work. He expressed concern about the kinds of services and products which governments tax and discussed the question of the unit of measure used for taxation purposes and the problem of distinguishing the value of information from its price to an end user. He suggested that governments may believe they have little choice except to move toward increased taxation of information and services but that such taxation could be based on the price of providing the services and information rather than on its inherent value. He also emphasized the international scope and ramifications of the information service economy.

Mr. Leeson also raised the issue of transborder data flow and discussed the U.S. government stance favoring the free flow of information, which appears to conflict with some national security restrictions on the export of information in machine-readable form.

Analyzing the Information Economy: Tools and Techniques

Sherman Robinson, Professor at the Department of Agricultural and Resource Economics at the University of California in Berkeley, prepared a paper on the Machlup and Porat studies and the methodologies underlying each study. His paper follows.

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(1) See references (2), (3), and (4) on page 5.

Analyzing the Information Economy: Tools and Techniques

Sherman Robinson

University of California, Berkeley

March 1985

1 Introduction

In recent decades, there has been a growing awareness that "information" has grown in economic importance relative to "goods." Observing this trend, those concerned with information policy have sought to understand how libraries and other information industries fit into the new economic structure. What is the size of the "information economy?" What are the links between "information sectors" and the rest of the economy? Answers to these questions must be sought before one can consider the role of libraries, or any other subsector, in the economy. Adequate answers require quantitative measures of the role of information in the economy. However, before one can provide measures of the information economy, it is first necessary to deal with a number of conceptual issues.

Economists developed the national income and product accounts (NIPA) to provide a systematic way of measuring economic activity. The NIPA provide an accounting framework for organizing data and generating statistics about the workings of the national economy. Such statistics describe what is going on in the economy and the interrelationships among sectors. An accounting system such as the NIPA must delineate the conceptual boundaries of the economy by indicating which activities are to be included and which excluded. Economists have been, and still are, preoccupied with defining the appropriate boundaries for the NIPA framework.[1]

While some issues are still outstanding, the major outlines of the national income and product accounts were settled in the 1930s. However, the notion of the "information economy" is relatively new. Fritz Machlup was the first to introduce the concept in a book published in 1962. Since it is a concept that still is not explicitly defined in the NIPA framework, thre is no standard definition of the information economy that can be used to generate data and develop statistics. The question is whether the existing framework provided by the NIPA can be used to define appropriate measures of the information economy, or must the NIPA be redefined in order to reflect the new

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1. Two Nobel prizes have been awarded to economists who were major contributors to this work: Simon Kuznets and, in 1984, Richard Stone.

economic structure? To answer this question, one must reexamine the theoretical framework underlying the NIPA and carefully define precisely what is meant by the concept of the "information economy" and its constituent sectors. What are "information services" and "information goods?"

This paper examines the methodologies underlying studies which attempt to measure the "information economy" and considers their applicability and limitations for analyzing policy issues concerning libraries and library networks. There are two major studies which will provide the major focus for discussion: (1) Marc Porat, The Information Economy: Definition and Measurement and (2) Fritz Machlup, The Production and Distribution of Knowledge in the United States.[2] Using quite different approaches, these studies seek to measure the size of the information economy. They also explore the links between the information economy and the rest of the economy. Both studies are based on economic accounting and a lot of the discussion revolves around what seem on first reading to be rather arcane statistical issues. These issues, however, are important as they reflect fundamental views about the role of information in the economy.

Both Machlup and Porat worry a great deal about the appropriate definition of the information economy and whether the existing accounting conventions in the NIPA are adequate for defining information goods and services. In general, Porat stays within the framework of the NIPA, while Machlup argues that the existing accounts are not adequate and must be redefined in order to capture the role of information in the economy. Both studies carefully refine the definitions of information activities (or sectors) and discuss in painstaking detail the data problems involved in measuring the concepts. While they have a number of differences in approach, the two studies are in close agreement about the overall trends. The details of their different approaches are fascinating, at least if you happen to be fascinated by economic accounting, but it is not necessary to dwell on them. The underlying accounting principles are similar in the two studies and involve only a few basic concepts.

2 The Circular Flow of Economic Activity

In all economic accounting systems, economists start from a very simple stylization of the economy. Figure 1 shows a stylized picture of an economy with three actors (producers, households, and rest of the world) and two markets (factor market and goods market). The arrows indicate the flows of real goods and services in the economy. For every real flow there is a money or "nominal" flow in the opposite direction, reflecting the notion that markets involve an exchange of money for something real (although perhaps

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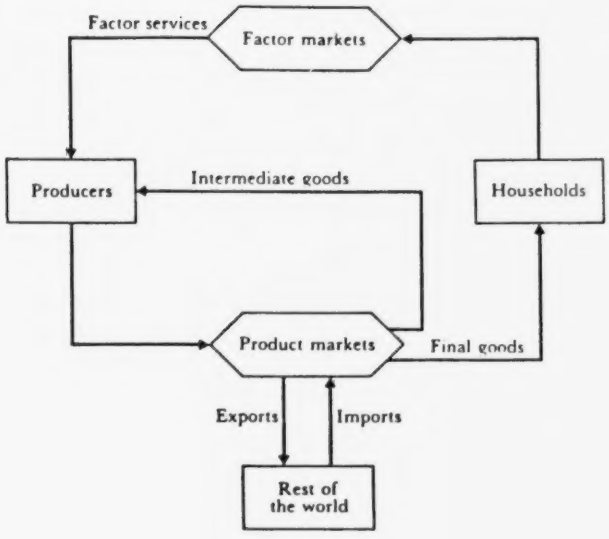
2. See also Machlup and Leeson (1978), Machlup (1980), Rubin and Taylor (1981), Rubin and Sapp (1981), and Cooper (1983). The Cooper article provides a good discussion of some of the differences in approach between Machlup and Porat.

FIGURE 1

Economywide Circular Flow



intangible). Start with households which are assumed to own all the labor and capital in the economy (that is, they consist of workers and capitalists, where capitalists include all stockholders). Labor and capital are called "factors of production" which provide "factor services" needed to produce output. In the factor markets, producers pay for these factor services in the form of wages, salaries, and profits; or "factor income."[3]

Producers sell their output on the product markets. Some of this output is sold to other firms for use as "intermediate inputs;" for example, the steel used to produce an automobile. Thus firms buy two different kinds of inputs: factors of production (labor and capital) and intermediate goods. Only the payments to labor and capital end up as income to households. The contribution to total factor income from a particular sector is measured not by the value of total production (or sales), but by that value minus the cost of intermediate inputs. Each sector's contribution to total income is thus measured by the value it adds over and above the cost of intermediate inputs, or its "value added." Value added in each sector equals the factor income generated in the sector --the terms are synonymous.[4]

Output not sold as intermediate inputs to other producers constitutes "final demand" and goes through the product market to households and to the rest of the world (exports). Gross National Product (GNP) is defined as the value of this final demand. The NIPA accounting framework is closed, with no leakages; that is, the expenditure and receipt (income) accounts of each actor must balance. All dollar inflows are spent and every penny is accounted for. The accounts describe a "circular flow" of nominal (dollar) expenditures and receipts (incomes) in one direction and a corresponding flow of products in the other direction, and the two must always balance.[5] GNP equals the total value of final demand, which equals the total value of production (or sales) minus the value of intermediate inputs, which equals total value added.

GNP is often broken down by broad categories of demanders: private consumption, government consumption, investment, and exports. In our simple stylization, "households" must thus be defined rather broadly to include the government (which, for example, buys missles) and purchasers of investment goods (which, for example, buy factories and machinery), as well as private consumers and the rest of the world. A second way of breaking down GNP is by

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3. Profits here are defined broadly to include all non-labor income.

4. The term "national income" is also used to describe payments to households and equals total value added minus depreciation and minus indirect taxes. For this paper, the distinction between national income and total value added, and the implicit differences in the definition of "households," are not important. For a more detailed discussion of the NIPA, see U.S. General Accounting Office (1981).

5. In practice, there is always an "errors and omissions" item in which to put lingering problems.

type of commodity (for example, classified by SIC codes).[6] A potential source of confusion is that total value added is often also broken down by sectors classified by SIC codes. In some presentations, it is often not clear which sectoral shares are being used.

Sectoral shares in GNP are conceptually different from sectoral shares in total value added (or national income). Which measure one uses depends on the focus of the analysis. The former (GNP) measures sectoral shares of output or deliveries to final demand in the product market, while the latter (value added) measures shares of total income or value added generated by different sectors. Both are useful measures of the importance of a given sector, but they refer to different markets. Is the interest in value added (or income) generated in a sector or in its output (either gross output or deliveries to final demand)?

3 Long-Run Trends in Economic Structure

Before looking at the size of the information economy in more detail, it is useful to provide a context by considering other long-run changes in the structure of the economy. Both Machlup and Porat were motivated to do their studies of the information economy because they believed that, over a long period, information had gradually become an important part of the economy. These changes in the role of information have not developed in isolation, but are part of other major strtuctural changes that occur in the long-run process of economic growth.

Figure 2 indicates the relationship between the structure of total value added as a "typical" economy grows from a per capita GNP of $100 (1964 dollars) to $1,500, which covers about 75 years of development.[7] The terminal year value of $1,500 per capita was roughly the level in Western European countries around 1965. By comparison, at that time, U.S. GNP per capita was about $3,200. The major trends show a dramatic decline in the share of the primary sector (largely agriculture) and a corresponding rise in the share of industry. Typically, the share of services rises some and then levels off. At the end of the process, an economy can be described as "industrialized." As countries continue to grow, the shares of industry and agriculture typically level off, and the share of services rises. As an economy becomes "mature," the share of services in GNP exceeds 50 percent, as is currently the case in most of Western Europe and the U.S.

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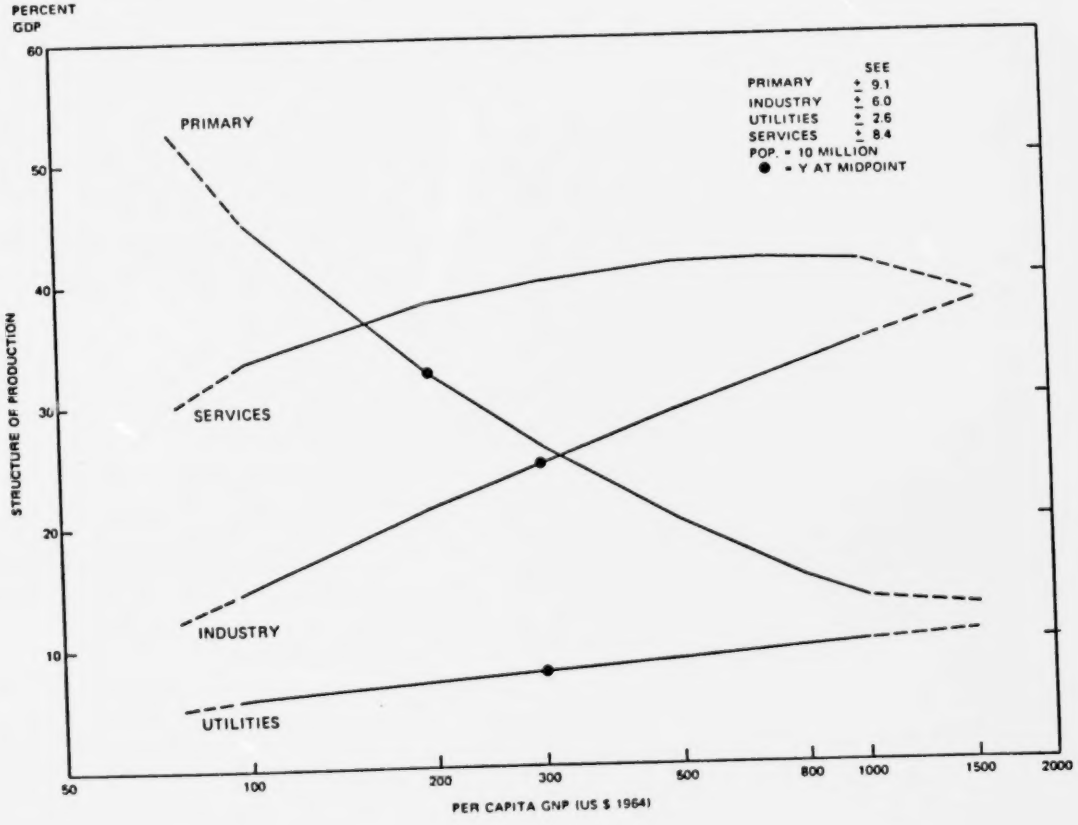
6. The standard industrial classification (SIC) codes provide a detailed classification of goods by type of industry at various levels of aggregation (according to the number of digits in the code).

7. The figure is taken from Chenery and Syrquin (1975) which is a study of long-term development based on data from a large number of countries.

Figure 2: Structure of Production (Value Added)



Source: Chenery and Syrquin (1975), p. 36.

Along with changes in the structure of production and final demand, there is also a long-run tendency for the share of intermediate goods in total production to rise.[8] This trend reflects the fact that, as economies become more developed, they also become more complex. Increasing specialization leads to increasing interdependence among sectors as producers rely more on an increasing variety of producers to provide intermediate inputs. To function, the increasingly complex economy must also generate more information flows. In order to make decisions about production levels and input demand, producers must know about conditions in a host of interrelated markets, including knowledge of rapidly changing technology and demand structure.

4 Economic Activities, Productive Activities, and Intermediate Goods

The growth of the information economy can be seen as part of the process of long-run growth and structural change. Measuring the role of information flows in this changing environment, however, strains the standard accounting methods that economists have developed. While the circular flow diagram helps to clarify the relationship between value added and national product, the stylization is very simple and ignores a number of definitional and conceptual issues. These issues are especially important in analyzing the role of the information economy.

To illustrate some of these problems, we will distinguish between productive and economic activities. A "productive activity" involves the production of goods and services which are used or consumed by agents in the economy: producers, consumers, and the rest of the world. An "economic activity" is a monetary exchange or transaction that involves a flow of money. In the NIPA, the intent is to measure productive activities, but money flows are usually easier to measure. The two things are not always the same.

Table 1 gives examples of how different types of activities are treated in the accounts. Activities are classified in four categories: (1) economic and productive, (2) economic and nonproductive, (3) noneconomic and nonproductive, and (4) noneconomic and productive. The first block, economic and productive, is the most straightforward. These are productive activities which result in goods and services that are marketed and hence, at least conceptually, are easily measured.[9] The "noneconomic-nonproductive" block is also conceptually straightforward. For example, happiness, while of interest to psychologists, is not something economists try to measure. Housewives' services have also been classified in the NIPA as being both noneconomic and

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8. This trend cannot be discerned from GNP data since, by definition, GNP excludes the value of intermediate inputs.

9. Nevertheless, there may be difficulties in data gathering. For example, measuring the size of the "underground economy" presents a number of data problems, although conceptually most of the activities are both economic and productive.

TABLE 1

Classification of Activities

	Economic	Noneconomic
Productive	Marketed (legal) goods and services	Owner-occupied housing Home production Subsistence farming Unpaid family workers
Nonproductive	Gambling Capital gains Mfg./sale of heroin Prostitution	Leisure Housewives services Happiness

nonproductive, but this classification raises some conceptual problems. While certainly not economic, at least in our society, a case can be made that housewives' services are productive. For example, if one hires a maid to do the same work, her/his services would be considered both productive and economic, and would be part of GNP. The decision to exclude housewives' services from GNP was based on the argument that they were very difficult to measure, even though conceptually they should probably be considered as productive.

Thirdly, there are a number of economic activities in which money changes hands but no goods or services are involved --they are in the "economic but nonproductive" block. For example, social security payments by the government involve large sums of money, but no production of goods and services. Such transfers are economic but not productive and have no affect on GNP. On the other hand, the NIPA define as "nonproductive" illegal activities such as heroin production which involve both money flows and the production of something tangible. Society has decided that such activities involve "bads", not goods, and should be excluded from GNP. For example, when prohibition was ended, the GNP rose as the production and distribution of liquor suddenly was included as a productive activity.

Finally, Table 1 lists a number of examples of activities which are productive but not economic. The housing services provided by owner-occupied houses, for example, clearly represent a productive activity, even though no money changes hands. The NIPA deal with this problem by imputing a rent to such housing. In effect, a homeowner is treated as a businessman who owns a building and rents it to himself. A fictitious economic activity is created corresponding to the productive activity which we wish to measure. The other examples present similar problems and are dealt with in the same way.

In valuing productive but noneconomic activities, the idea is to impute a value to the activity as if it were marketed. How to impute the "correct" value when there is no actual market transaction raises difficult problems. There are basically two approaches used in the NIPA to make such imputations. The first is to identify a comparable marketed items and use its price. In the case of owner-occupied housing, one looks at market rents for similar houses. When there are no comparable marketed goods, a second approach is to value the non-marketed goods at their cost of production. For example, there is no market for government services and there are no comparable marketed goods whose price could be used. Consequently, the government's contribution to GNP is estimated as its cost of productiion: the value of the wages and salaries of government employees and government purchases of goods and services.

Measuring the information economy involves a number of conceptual measurement problems similar to those considered in the examples in Table 1. Machlup and Porat deal with these problems in different ways. In general, Porat stays within the framework of the U.S. national income and product accounts and simply classifies some of the existing activities as being part of the information economy. Machlup, on the other hand, goes beyond the existing definitions in the NIPA and defines a number of activities which are not currently counted in GNP as being productive. For example, Machlup considers education in the home by parents as being a productive activity and part of the information economy. He then estimates how much of this activity there is and imputes a value to it (in this case, the wages the teacher-parent

could have earned in the labor market). He is both defining the scope of the information economy and changing the definition of GNP. He feels, with some justification, that the existing accounting definitions do not properly reflect the productive activities that are part of the information economy.

Machlup and Porat also differ in their treatment of information as an intermediate good. For example, Machlup argues that much of advertizing, which is treated in the NIPA as an intermediate cost of production and hence not part of GNP or value added, should be considered as long-term investment. He treats it as part of final demand and includes it in GNP. In this case, Porat stays with the standard NIPA definitions and excludes advertizing from GNP.

Libraries provide another interesting example of the deficiencies of the NIPA framework. A library's book collection can be viewed as part of its capital stock, in which case new aquisitions should be classified as investment. In the NIPA, however, aquisitions by public sector libraries are counted as part of government consumption and aquisitions by private sector libraries are counted as intermediate inputs.

While Porat stays much closer than Machlup to the standard NIPA definitions, he does make an effort to distinguish information activities that occur within existing sectors. He distinguishes between the "primary" information sector and the "secondary" information sector, where the secondary sector produces information only as an intermediate good. This distinction will be discussed in more detail below in the context of input-output accounts. Machlup, on the other hand, tends to focus on the share of information in total final demand (or GNP) and does not separately consider the role of information goods as intermediate inputs.

5 Definition and Size of the Information Sector

Tables 2 and 3 provide the definitions of the information sectors in the Machlup and Porat studies. Their differences in methodology are evident from the two lists. Machlup is quite willing to break away from the standard definitions in order to focus on the special role of information, while Porat seeks simply to classify sectors within the existing framework. Each approach has advantages and problems.

Machlup, in redefining GNP, provides a broader conceptual framework in which the role of information is highlighted. The disadvantage of the Machlup approach is that anyone using it must do a great deal of data adjustment and imputation in order to measure the broader concepts, including adjusting the GNP accounts. Porat's approach, on the other hand, involves a straightforward classification of sectors, with no problems of imputation or redefinition.[10] Porat, however, in using the standard accounting

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10. One should not confuse "straightforward" with "easy." The Porat study works with data at a level of aggregation of around 500 sectors. Rubin and

TABLE 2:

Industry or Branch of Knowledge
Production Used by Machlup in Deriving
Total Knowledge Production in the United States

Education

- Education in the home
- Training on the job
- Education in the Church
- Education in the Armed Forces
- Elementary and Secondary
- Colleges and Universities
- Commercial, Vocational
- Federal Programs
- Public Libraries

Research and Development

- Basic Research
- Applied Research and Development

Media of Communication

- Printing and Publishing
- Photography, Phonography
- Stage, podium, and screen
- Radio and Television
- Telecommunications media
- Conventions

Information Machines

- Printing Trades Machinery
- Musical Instruments
- Motion Picture Apparatus
- Telephone and Telegraph Equipment
- Signaling Devices
- Measuring and Controlling instruments
- Typewriters
- Electronic computers

Information Services

- Professional Services
- Financial Services
- Wholesale Agents
- Government

(Source: The Production and Distribution of Knowledge in the United States, Fritz Machlup, Princeton University Press, 1962.)

TABLE 3 TYPOLOGY OF PRIMARY INFORMATION SECTOR INDUSTRIES

KNOWLEDGE PRODUCTION AND INVENTIVE INDUSTRIES

- R&D and Inventive Industries (private)
- Private Information Services

INFORMATION DISTRIBUTION AND COMMUNICATION INDUSTRIES

- Education
- Public Information Services
- Regulated Communication Media
- Unregulated Communication Media

RISK MANAGEMENT

- Insurance Industries (components)
- Finance Industries (components)
- Speculative Brokers

SEARCH AND COORDINATION INDUSTRIES

- Search and Non-Speculative Brokerage Industries
- Advertising Industries
- Non-Market Coordinating Institutions

INFORMATION PROCESSING AND TRANSMISSION SERVICES

- Non-Electronic Based Processing
- Electronic Based Processing
- Telecommunication Infrastructure

INFORMATION GOODS INDUSTRIES

- Non-Electronic Consumption or Intermediate Goods
- Non-Electronic Investment Goods
- Electronic Consumption or Intermediate Goods
- Electronic Investment Goods

SELECTED GOVERNMENT ACTIVITIES

- Primary Information Services in the Federal Government
- Postal Service
- State and Local Education

SUPPORT FACILITIES

- Information Structure Construction and Rental
- Office Furnishings

(Source: The Information Economy: Definition and Measurement, Marc Uri Porat, 1977)

conventions, has trouble relating existing sector definitions to his notion of the information economy. Many of his classification decisions seem somewhat arbitrary.

The treatment of education provides a good example of the differences in approach. In Table 2, Machlup breaks education into nine different categories, of which the first three and the last are not defined as productive activities in the usual definition of national product. To include these categories, the definition of GNP must be broadened. Their inclusion also raises problems of imputation. Porat stays within the standard definitions and so has one entry for education (under "Selected Government Activities"). One might also note that Machlup lists public libraries separately under education, while in the Porat study public libraries are included with the "rest of government" where they are lost among other government activities. In staying within the existing sector definitions provided by the SIC codes, Porat cannot focus on sectors that may be especially interesting when seen as part of the information economy, but which are a small part of sectors as conventionally defined.

While they have significant differences in methodology, the two approaches yield broadly similar results. Machlup found that, in 1958, 29 percent of adjusted GNP consisted of "knowledge" goods and services, measuring from the output side of the circular flow.[11] In a not-yet published update to Machlup's work, Rubin *et al.* (1984) found that, in the late 1960s and 1970s, the share of adjusted GNP devoted to knowledge goods according to Machlup's definition rose to about one third. Porat found that, in 1967, the information sector accounted for 22 percent of GNP from the product side.[12] Given Machlup's wider and more inclusive definition, it is not surprising that he finds a somewhat larger share than Porat. Indeed, it is interesting to note how small the difference is.

Table 4 gives the value added shares of information sectors using the Porat methodology.[13] From this side, information sectors account for about a quarter of total value added in the economy, with little change between 1967 and 1972. Thus, from either the value added or final demand sides, the role of the information sectors is broadly similar and important.

While it is important to measure the size of the information economy, it is perhaps more important to understand its links with the rest of the economy. To analyze this aspect, one needs more than the national income and product accounts. It is necessary to explore the links between sectors and, in particular, to focus on the flows of intermediate goods in the economy. While Machlup was not concerned with this issue, Porat focused on the role of information as an intermediate good. The national income and product accounts

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Taylor (1981) provide a summary of the classification of sectors using 4-5 digit SIC codes.

11. See Machlup (1962). Also cited in Cooper (1983).

12. See Porat(1977), p. 50. Also cited in Cooper (1983).

13. The table is taken from a study by Rubin and Taylor (1981).

TABLE 4: Gross product originating by industry, 1972 and 1967 (millions $)

	Total Value Added	Information Value Added	Information Percent of Total	
	1972	1972	1972	1967
All Industries, Total	1,182,766	293,796	24.8	25.1
Agriculture, forestry and fisheries	32,163	0	0	0
Mining	18,881	0	0	0
Construction	76,107	6,613	8.6	23.6
Manufacturing	293,400	39,508	13.5	14.6
Nondurable goods	122,870	14,371	11.9	13.0
Food and kindred products	32,610	0	0	0
Tobacco manufacturers	4,443	0	0	0
Textile mill products	8,556	0	0	0
Apparel	10,195	0	0	0
Paper products	10,663	1,872	17.6	19.2
Printing and Publishing	14,355	12,699	88.4	95.4
Chemical products	22,412	0	0	0
Petroleum refining	7,547	0	0	0
Rubber and plastic products	9,875	0	0	0
Leather products	2,214	0	0	0
Durable goods	170,530	24,937	14.6	13.7
Lumber and wood products	8,319	0	0	0
Furniture and fixtures	4,604	603	13.1	15.6
Stone, clay and glass products	10,289	0	0	0
Primary metal industries	20,877	0	0	0
Fabricated metal products	19,839	0	0	0
Machinery, except electrical	23,758	3,925	16.5	13.3
Electrical Machinery	32,404	13,247	40.9	60.7
Transportation equipment	12,550	0	0	0
Motor vehicles	21,437	0	0	0
Ordnance	4,060	0	0	0
Miscellaneous manufacturing	4,708	959	20.4	23.3
Instruments	7,685	6,203	80.7	76.9
Transportation	44,875	0	0	0
Communication	28,357	28,357	100	100
Electric, gas and sanitary services	25,281	0	0	0
Wholesale and retail trade	166,103	16,386	9.9	12.4
Finance and insurance	43,970	42,659	97.0	99.5
Real Estate and rental	141,084	27,955	19.8	18.6
Services	161,267	66,414	41.2	49.4
Hotels; personal & repair serve..	17,471	1,152	6.6	8.7
Automobile repair	11,429	0	0	0
Business services	47,221	37,192	78.8	89.8
Amusements	6,674	2,573	38.6	37.9
Medical, Educational & nonprofit.	57,524	25,497	44.3	50.3
Other	20,948	0	0	0
Government	146,609	65,904	45.0	45.4
Federal Government Enterprises	8,244	5,856	71.0	75.4
State & Local Gov't. Enterprises.	6,417	0	0	0
General Government	131,948	60,048	45.5	45.5
Rest of the World	6,918	0	0	0
Household industry	5,349	0	0	0
Inventory valuation adjustment	-7,591	0	0	0

Source: Rubin and Taylor (1981), p. 165.

exclude intermediate goods and so cannot provide a framework for analyzing their role. Porat used input-output analysis, which explicitly keeps track of flows of intermediate goods in the economy, to explore these links and to define what he called the "secondary" information sector. In order to understand his approach, it is necessary to discuss the input-output accounts on which the analysis is based.

6 The Input-Output Accounts

Figure 3 provides a schematic presentation of an input-output table. An input-output table is a generalization of a spreadsheet using double-entry bookkeeping. It shows the circular flow in one table. Final demands for sectoral outputs appear as columns on the right hand side and define GNP. Incomes to factors of production appear as rows at the bottom of the table and define value added (and national income) by sector. The body of the table consists of a square matrix indicating the transactions among sectors. The entries describe the flows among producing sectors, or expenditures on intermediate inputs, and capture important linkages in the economy. Each cell represents a purchase of intermediate inputs by a column from a row, or a flow of money from a column sector to a row sector. For each sector, the column sum indicates the total value of expenditures and the row sum indicates the total value of sales. The two totals must balance for each sector.

Compare the input-output table to the circular flow diagram in Figure 1. The value added rows at the bottom reflect purchases on factor markets while the final demand columns on the right indicate sales of final goods to households (or consumers), government, and the rest of the world. Because they explicitly include intersectoral flows of intermediate goods, the input-output accounts contain more information than the national income and product accounts. These standard accounts focus only on final demand and value added, and hence ignore a lot of important economic transactions.

7 An Input-Output Table with "Information" Sectors

Tables 5, 6, and 7 present an input-output table for the United States. It is based on an updated 1977 input-output table for the U.S. which was developed at The University of California, Berkeley.[14] I aggregated the table from a larger table, but I had problems splitting some sectors as Porat defined them and had to make a number of *ad hoc* adjustments. The table should thus be seen as only illustrative of the orders of magnitude. It provides an

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14. The table was estimated using various projection techniques. It is not based on the new 1977 input-output table which has just become available from the Bureau of Economic Analysis (BEA).

Figure 3: Schematic Presentation of NIPA and Input–Output Accounts

GROSS NATIONAL PRODUCT

In the National Income and Product Accounts

CHARGES AGAINST GNP	GNP
Compensation of employees Proprietors' income Rental income of persons Corporate profits Net interest Business transfer payments Indirect business taxes Less: Subsidies less current surplus of government enterprises Capital consumption allowances	Personal consumption expenditures Gross private domestic investment Net exports Government purchases

In an Input-Output Format

	PRODUCERS	FINAL DEMAND				
PRODUCERS	[redacted]	Personal consumption expenditures	Gross private domestic investment	Net exports	Government purchases	GNP
VALUE ADDED	Compensation of employees					
	Profit-type income*, net interest & capital consumption allowances					
	Indirect business taxes					
	Charges against GNP					

*Consists of proprietors' income, rental income of persons, corporate profits, and business transfer payments, less subsidies, etc.

U.S. Department of Commerce, Bureau of Economic Analysis

INPUT-OUTPUT TABLE

		PRODUCERS									FINAL DEMAND (GNP)				GROSS OUTPUT
		Agriculture	Mining	Construction	Manufacturing	Transportation	Trade	Finance	Services	Other	Personal consumption expenditures	Gross private domestic investment	Net exports	Government purchases	
PRODUCERS	Agriculture	[redacted]													
	Mining														
	Construction														
	Manufacturing														
	Transportation														
	Trade														
	Finance														
	Services														
	Other														
VALUE ADDED (Charges against GNP)	Compensation of employees														
	Profit-type income, net interest & capital consumption allowances														
	Indirect business taxes														
GROSS INPUT															

*Consists of proprietors' income, rental income of persons, corporate profits, and business transfer payments, less subsidies, etc.

U.S. Department of Commerce, Bureau of Economic Analysis

Source: Ritz (1979), p. 36.

TABLE 5:

1977 Input-Output Table: Flows (billions $)

Receipts	Expenditures 1	2	3	4	5	6	7	8	9	10	11
Sector	i bldg	i nondur	i durbl	i svcs	primary	light	heavy	svcs	total	fnl dmnd	sales
1 Info buildings	.0	.0	.0	.0	.0	.0	.0	.0	.0	50.6	50.6
2 Info nondurables	.2	14.1	1.1	8.7	.1	10.0	7.0	9.8	51.0	14.9	65.9
3 Info durables	.2	.8	18.5	3.3	.1	1.0	6.8	5.2	35.9	54.1	90.0
4 Info services	4.5	4.5	5.2	89.1	20.0	17.0	30.0	115.5	285.8	368.2	654.0
5 Agriculture & mining	1.9	.3	.0	1.2	44.0	66.1	80.4	22.2	216.1	-13.2	202.9
6 Light manufacturing	3.9	5.1	1.8	4.8	1.0	109.3	18.3	46.3	190.5	223.7	414.2
7 Heavy manufacturing	9.4	3.7	14.0	13.3	20.4	44.8	293.3	114.0	512.9	283.6	796.5
8 Non-info services	10.0	8.9	8.6	43.2	19.6	40.9	85.5	153.2	369.9	939.2	1,309.1
9 Total intermediates	30.1	37.4	49.2	163.6	105.2	289.1	521.3	466.2	1,662.1	1,921.1	3,583.2
10 Labor income	15.7	20.3	33.4	322.4	25.1	82.6	193.1	484.4	1,177.0		
11 Non-labor income	4.4	7.6	6.7	103.3	66.0	30.4	69.1	283.4	570.9		
12 Indirect taxes	.4	.6	.7	64.7	6.6	12.1	13.0	75.1	173.2		
13 Value added (10-12)	20.5	28.5	40.8	490.4	97.7	125.1	275.2	842.9	1,921.1		
14 Total outlay	50.6	65.9	90.0	654.0	202.9	414.2	796.5	1,309.1	3,583.2		

Source: author's estimates (see text).

TABLE 6:

1977 Input-Output Table: Column shares (percent)

Receipts	Expenditures 1	2	3	4	5	6	7	8	9	10	11
Sector	i bldg	i nondur	i durbl	i svcs	primary	light	heavy	svcs	total	fnl dmnd	sales
1 Info buildings	.0	.0	.0	.0	.0	.0	.0	.0	.0	2.6	1.4
2 Info nondurables	.4	21.4	1.2	1.3	.0	2.4	.9	.7	1.4	.8	1.8
3 Info durables	.4	1.2	20.6	.5	.0	.2	.9	.4	1.0	2.8	2.5
4 Info services	8.9	6.8	5.8	13.6	9.9	4.1	3.8	8.8	8.0	19.2	18.3
5 Agriculture & mining	3.8	.5	.0	.2	21.7	16.0	10.1	1.7	6.0	-.7	5.7
6 Light manufacturing	7.7	7.7	2.0	.7	.5	26.4	2.3	3.5	5.3	11.6	11.6
7 Heavy manufacturing	18.6	5.6	15.6	2.0	10.1	10.8	36.8	8.7	14.3	14.8	22.2
8 Non-info services	19.8	13.5	9.6	6.6	9.7	9.9	10.7	11.7	10.3	48.9	36.5
9 Total intermediates	59.5	56.8	54.7	25.0	51.8	69.8	65.5	35.6	46.4	100.0	100.0
10 Labor income	31.0	30.8	37.1	49.3	12.4	19.9	24.2	37.0	32.8		
11 Non-labor income	8.7	11.5	7.4	15.8	32.5	7.3	8.7	21.6	15.9		
12 Indirect taxes	.8	.9	.8	9.9	3.3	2.9	1.6	5.7	4.8		
13 Value added (10-12)	40.5	43.2	45.3	75.0	48.2	30.2	34.6	64.4	53.6		
14 Total outlay	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0		

Source: Table 5

TABLE 7:

1977 Input-Output table: Row Shares (percent)

Expenditures	Receipts 1	2	3	4	5	6	7	8	9	10	11
Sector	i bldg	i nondur	i durbl	i svcs	primary	light	heavy	svcs	total	fnl dmnd	sales
1 Info buildings	.0	.0	.0	.0	.0	.0	.0	.0	.0	100.0	100.0
2 Info nondurables	.3	21.4	1.7	13.2	.2	15.2	10.6	14.9	77.4	22.6	100.0
3 Info durables	.2	.9	20.6	3.7	.1	1.1	7.6	5.8	39.9	60.1	100.0
4 Info services	.7	.7	.8	13.6	3.1	2.6	4.6	17.7	43.7	56.3	100.0
5 Agriculture & mining	.9	.1	.0	.6	21.7	32.6	39.6	10.9	106.5	-6.5	100.0
6 Light manufacturing	.9	1.2	.4	1.2	.2	26.4	4.4	11.2	46.0	54.0	100.0
7 Heavy manufacturing	1.2	.5	1.8	1.7	2.6	5.6	36.8	14.3	64.4	35.6	100.0
8 Non-info services	.8	.7	.7	3.3	1.5	3.1	6.5	11.7	28.3	71.7	100.0
9 Total intermediates	.8	1.0	1.4	4.6	2.9	6.1	14.5	13.0	46.4	53.6	100.0
10 Labor income	1.3	1.7	2.8	27.4	2.1	7.0	16.4	41.2	100.0		
11 Non-labor income	.8	1.3	1.2	18.1	11.6	5.3	12.1	49.6	100.0		
12 Indirect taxes	.2	.3	.4	37.4	3.8	7.0	7.5	43.4	100.0		
13 Value added (10-12)	1.1	1.5	2.1	25.5	5.1	6.5	14.3	43.9	100.0		
14 Total outlay	1.4	1.8	2.5	18.3	5.7	11.6	22.2	36.5	100.0		

Source: Table 5

Table 8

BEA Codes & Names for Information Industries

BEA	Name
	CONSTRUCTION INDUSTRIES
11*	Information Buildings
12*	Maintenance & Repair on Information Buildings
	NONDURABLE GOODS INDUSTRIES
24*	Paper (for printing and excluding boxes)
26*	Printing & Publishing
27*	Ink
	DURABLE GOODS INDUSTRIES
23*	Office Furniture & Equipment
48*	Machinery for Printing & Paper
51*	Computer, Calculators, & Office Machines
53*	Electronic Measuring Instruments
56*	Radio, TV, & Communication Equipment
57*	Electronic Components
58*	Miscellaneous Electronic Instruments
62*	Mechanical Measuring & Control Instruments
63*	Photographic & Related Equipment
64*	Advertising Signs & Displays
	SERVICES INDUSTRIES
66*	Telecommunication (excluding Radio & TV)
67*	Radio & TV Broadcast & CATV
69*	Trade Margin on Information Goods
70*	Finance & Insurance
71*	Real Estate
72*	Repair of Radio & TV Equipment
73*	Miscellaneous Business Information Services
76*	Motion Pictures & Theatre
77*	Medical, Education, & Non-profit Services
78*	Postal Service
82*	Office Supplies
84*	Federal Government Information Workers

Notes: BEA: Bureau of Economic Analysis

Source: University of California, Los Angeles (1984), p. 60.

example to illustrate how input-output analysis can be used. The definition of the aggregate sectors is given in Table 8.[15]

From Table 6, one can see that the information sector comprises 25 percent of total final demand from the product side.[16] Table 7 shows that the information sectors comprise 30 percent of total value added on the income side.[17] The 30 percent number in my illustrative table seems too high given that Porat found a value of 25 percent in 1967 and Rubin *et al.* (1984) found almost no change in 1972. My overestimate comes from the fact that I was not able to split some of the sectors that Porat split and have thus overcounted somewhat.

Looking at the sectoral detail, note the importance of the service sectors. They comprise 76 percent of the value of information goods (product side) and 84 percent of information value added (income side). Since the service sectors contain the largest numbers, we should focus our attention there. The empirical predominance of the service sectors in the information economy also indicates that many of the difficult and arbitrary decisions about how to classify particular goods which Machlup and Porat debated are not too important.

Looking at the table of intermediate flows, note the importance of information as an intermediate input. Looking along the rows, information sectors sell a large share of their output to other sectors as intermediate inputs (43 percent in aggregate, ranging from 0 for buildings to 77 percent for information nondurables).[18] Intermediate flows of information goods are 22 percent of total intermediate flows in the entire economy.[19] Information sectors are thus an important part of the interindustry linkages in an increasingly complex economy.

One view of the information sectors is that they are an important part of the "infrastructure" of the economy. In principle, the input-output table provides a framework for analyzing this role, but there are problems of sector aggregation. The standard sectors are defined by industry categories, some of which are classified as being information sectors. Porat argues, however, that within each sector (or enterprise), a significant part of the production process involves "secondary" information activities. Porat refers to these activities as secondary because they produce intermediate inputs which are

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15. The aggregation was taken from that used in a conference on "Libraries & the Information Economy of California: Public Policy Issues and Needed Research" sponsored by the California State Library and held at the UCLA Lake Arrowhead Conference Center, March 18-21, 1984.

16. That is, 2.6 + 0.8 + 2.8 + 19.2 = 25.4.

17. That is, 1.1 + 1.5 + 2.1 + 25.5 = 30.2.

18. Table 7, column 9.

19. From Table 5, column 9, summing the first four items and dividing by 1,622.1.

used within each sector and are not marketed. Since they produce only intermediates, these secondary information activities have no effect on overall GNP or value added. However, by classifying part of each sector's activity as producing information, Porat significantly expands the definition of the information economy.

Porat disaggregates these secondary information sectors in the input-output accounts by creating fictitious sectors that produce information which they sell to existing sectors. In effect, Porat defines an "information division" in every sector or enterprise and treats it as a separate entity in the accounts which sells only to its parent enterprise. The effect of this redefinition is to increase total gross output and intermediate flows, but total value added and final demand remain unchanged. By breaking out more information activities, Porat is able to provide a richer analysis of the interactions between the information sectors and the rest of the economy.

Figure 4 presents in schematic form the technique that Porat used in defining the secondary information sectors. Each secondary information sector is assumed to sell intermediate goods to itself and to the corresponding non-information sector (and some small sales to final demand). It purchases intermediate inputs from the primary information sector and also generates value added. The new secondary information sector is important. Value added in the secondary information sector is 21 percent of GNP (in 1967), while the primary information sector accounted for 25 percent. The two together account for 46 percent of GNP, which is the number most often quoted from the Porat study.

8 Input-Output Models

One can do more with the input-output table than simply look at the magnitudes. Table 6 gives input shares of sectoral output, which are called "input-output coefficients." It is often assumed that these coefficients are fixed over time, which is a reasonable assumption, at least for relatively short periods.[20] Given the assumption of fixed coefficients, one can use the model to analyze "linkages" in the economy and to trace the direct and indirect effects of changes. For example, one can determine what would be the impact on the information sectors of a given change in the size and structure of final demand.[21] Porat uses the model to do this type of analysis, exploring the strength of the links between the information sectors and the rest of the economy.

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20. If the coefficients do change, they usually change systematically in ways that can be captured in more ambitious models.

21. This sort of analysis with input-output models is fairly standard and has been used in the U.S. and other countries with regard to questions other than the role of information.

There are a variety of other uses of input-output models which have been developed in other contexts that might be useful to pursue in analyzing the information economy. For example, one view of information is that it generates "externalities" in the system; that is, information flows generated by one sector provide benefits to other sectors that are not marketed and hence are not valued in the economy.[22] Note that these externalities are different from the secondary information sector discussed earlier. Output from the secondary information sector is paid for by the using sector and hence is valued properly. Information as an externality, on the other hand, can be seen as affecting the environment in which firms operate by making them more productive without any direct action on their part. For example, trade associations (and their special libraries) provide information that is beneficial to the various firms within an industry (or sector), but for which they may not pay directly. In the input-output model, such trade associations appear as part of the service sectors and are not seen as producing intermediate goods. The input-output model can be extended to analyze such externalities, but it is not easy. Such extended input-output models have been developed for analyzing pollution, which is a "negative externality."[23] Conceptually, it should be possible to consider information, which would be a "positive externality," in a similar analytic framework.

The treatment of libraries in the input-output accounts provides a good example of the need to extend the standard input-output framework in dealing with information as an externality. Libraries should be seen as part of the "secondary information sector" producing an intermediate input used by the rest of the economy, as well as producing information for final demand. However, in the input-ouput accounts, libraries are considered as producing only for final demand, delivering no intermediate inputs to other sectors. That part of their services which aid producing sectors is not counted at all, but should (and could) be seen as a non-marketed externality libraries provide to tbe economy.

In general, input-output models --and the accounts on which they are based-- provide a good framework for analyzing the role of the information economy. Their use represents a real advance over the earlier work of Machlup which sought mainly to delineate the boundaries of the information economy. Porat and his associates (in particular, M. Rubin) have pioneered this work, but there remain a number of areas for fruitful research.

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22. Information is also seen as a "public good" in that the use of information by one demander does not affect the amount available for use by others.

23. See, for example, Leontief (1970).

9 Conclusion

While input-output analysis provides a flexible tool for analyzing interactions, the framework also has a number of limitations. Porat started with an input-output table with around 500 sectors and even at that level of detail he had problems classifying sectors as being within or outside of the information economy. Both Porat and Machlup had to deal with major data problems, including imputing values to non-marketed information goods and dealing with statistical concepts not easily accomodated within the framework of the national income and product accounts.

The economywide framework is important for considering how the information economy fits into the broader system, but also limits the analysis to sectors which are large enough to have interesting links with the rest of the system. Even at the most detailed level of aggregation, for example, libraries are a small part of either the "other nonprofit organizations" sector, or the "local government" sector. Therefore, they cannot be analyzed separately within the input-ouput accounts. Even if they could be defined as a separate sector, it would probably not be worth doing so because their linkages with the rest of the economy are bound to be small. By definition, they sell only to final demand and their purchases of intermediate inputs are a small part of the sectors in which they have been aggregated.

Conceptually, it is important to analyze the role libraries play as part of the information sector within an economywide framework. However, the specific role of libraries is probably better analyzed using a different methodology. One should focus on libraries separately using a "case study" approach and not try to include them as a distinct sector in an economywide framework. The input-output accounts and models based on them are designed for analyzing a system of interlinked sectors, but must rely on relatively aggregated data. Input-output analysis is a useful tool for looking at the forest, and for looking at groves of trees and the paths between them, but not for looking at individual trees.

The analytic categories developed by Machlup and Porat have gradually become accepted as part of the "tool box" of economics and have strongly influenced the way we view information and its role in the economy. In a detailed analysis of the role of libraries, it is relevant to use the analytic concepts developed to delineate the boundaries of the information economy and to explore its links with the rest of the economy. An understanding of the role of information sectors in the economy is necessary to provide a context for considering the role of individual subsectors such as libraries within the information economy.

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Report on the Information Industry Association Study

Brett Butler, President of Information, Investment & Intelligence Incorporated (Infour), summarized the 1984 Information Industry Association (IIA) study on the information industry. He cautioned that there had been no attempt to validate information gathered in the survey, in which participation had been voluntary. Nethertheless, it did give an interesting view of some aspects of the industry which Mr. Robinson had identified as being in need of further clarification and data. The study identified the 1983 worldwide revenues of the information sector as $72 billion, with information companies based in the United States accounting for about $13 billion of that. Economic and market-related uses account for almost 50 percent of company services in the United States. Print still represents 64 percent but online activities are growing, representing some 17 percent. Mr. Butler also distributed an extract of the IIA report, "Business of Information, 1983" with permission from Paul Zurkowski at the IIA.

Concrete Example of Using Tools and Techniques

Michael J. Turillo, Jr., Peat, Marwick, Mitchell & Co., responsible for marketing and planning in New England and chairman of the Committee on Strategic Planning for Financial Institutions, directed his presentation toward 1) suggesting strategic planning tools and techniques and, in the strategic planning process, to assist in decision-making, and 2) illustrating how these tools had been put into practice in the financial services industry.

Strategic planning is a vehicle for recognizing external environmental changes and developing organized reactions or plans to respond appropriately. The objective of planning is not to solve all problems simultaneously or implement all programs at once, but rather to recognize areas requiring change and, subsequently, break them down into smaller segments, so as to prioritize and address each segment's needs and reassemble them in a more organized fashion. Essentially then, what appears to be an unmanageable effort is broken down into manageable tasks and attacked one at a time.

There are three basic stages that most organizations go through in planning. They are:

- o Stage one is financial planning or budgeting. It is essentially working with existing funds to match them with existing requirements. It is to meet the budget.

- o Stage two is the prediction of future needs of the organization by management. It is to anticipate change and plan for it. The organization solicits information from the outside and addresses not only financial issues but issues such as market share and competition actions. In

so doing, the organization anticipates what changes are taking place and what the organization's requirements will be to respond to the changes.

- o Stage three is the strategic planning stage for the organization. Rather than react to or even forecast the environment in which they will operate, the organization becomes involved in shaping the environment. Rather than seeking what will be, the organization attempts to determine what should be and what must be done to make it happen.

Determining what should be is only the first half of the planning process. The second half is equally important because it addresses what must be done to make it happen. A plan can be described as follows: I must lose weight, or I will not become a proficient tennis player, and it is going to take a while to do it.

This is a strategic, long-range plan. Some insight is provided in terms of what the goals and aspirations are. There is an indication that it will take time to reach the goal. However, two critical things have been left out in this plan, 1) no opportunity is given to appraise whether or not the process by which to lose weight, or become a proficient tennis player, is an appropriate process, logical and consistent with the goal, and 2) there is no basis for monitoring progress towards the goal or evaluating whether or not you have been successful. Will 10 pounds in 2 months define success, or 20 pounds in six weeks? Is a proficient tennis player one who is not embarrassed to play in public or one who gets to the quarter finals at Wimbledon?

To give the plan meaning, it must be substantiated by explaining how it will be achieved, how to establish time parameters, and what will constitute success. For example, I will lose twenty pounds in two months by exercising three hours a day and limiting my caloric intake to 1,500 calories per day. Or, I will become a proficient tennis player so as to compete in the club championship next year by taking three hours of professional lessons weekly and getting court time for four hours each week.

Three important things need to be done. The ability now exists to appraise whether the "action plan" will accomplish the goals and objectives, secondly, it can be monitored on an on-going basis to see if progress is made toward the goals and objectives, and thirdly, it can be determined whether or not the objective is met successfully.

The planning process itself can help accomplish several things for an organization. Specifically, it can help:

- o Provide focus
- o Understand consequences and interrelationships
- o Narrow alternatives
- o Set priorities

- o Define the parameters of activity
- o Set guidelines
- o Provide uniform purpose
- o Provide insight to answers

On the other hand, planning and the plan itself are not a panacea. They do not solve problems, but provide a structured methodology for identifying problems and dealing with them. Specifically, planning does not provide the answers or make it happen. People must provide the answers and produce the results - planning is an effective tool to do just that. The plan must not be static, cast in stone, or blindly followed. It is a series of action steps based on an assessment of the internal and external environment at a given point in time. As time passes and the environment changes, the activities must change and respond to the new environment.

Other examples of strategic planning are: 1) NASA, on any shuttle flight, often calls for "mid-course corrections." This is not because they made "a mistake." They were most likely correct based on the information available to them at the time. As new or more accurate information became available (change in wind speed or direction, etc.), they re-evaluated their current course (action plan) and updated it (mid-course correction) in order to insure that the objective was achieved; 2) a college librarian, learning of the administration's intent to establish an engineering school, prepares a plan to buy additional technical journals and hire staff with new skills. When the engineering school is put on hold for two years, the librarian modifies his plan accordingly. Modification and redirection are a natural part of planning. Planning should not be isolated and not be expected to eliminate mistakes. It does help develop a clearer understanding by individuals and groups of what is necessary to attain the goals and objectives of an organization.

Although libraries, typical not-for-profit organizations, are not associated with having direct competition, in reality they have a wide range of competition. Libraries have functional competition, from access to information to selection and distribution of information. Research and information were historically associated with libraries, but with the advent of low cost computers and electronic time share services, the need to visit the library has diminished. And just as this type of competition threatens traditional libraries, so too does the boom in home video cassette recorders, which in the near term may merely decrease the time available for reading "library books," but in the long run may entirely change the way people access and "read" both fiction and non-fiction. In addition, competition for funds has increased and will continue to increase as government sources dry up and there is more competition for private sector support.

Libraries have traditionally been reactive in the sense that they are provided funds from an outside source to meet "cost." Today's library, planning for its future existence, must recognize the

value of its services and link its funding to the added value. Knowing its customers' needs and information requirements, libraries can lead clients to new sources and can anticipate the type of information required. For example, my firm spends hundreds of thousands of dollars annually buying information. The amount of information is not justified by its cost but rather by the value of the information in resolving a management decision issue.

Competition between libraries does exist and will become more intense. The competition will be primarily in packaging or presentation. Full-service libraries will not have substantially different books, periodicals or maps, but the manner in which the information is presented to the user, the format, will be the basis for competition.

Organizations as a rule choose one of the three basic competitive strategies developed by Michael Porter[1] to build upon their competitive strength and minimize their weakness.

- o The first strategy suggests being the lowest cost provider in the market. A traditional library would pare expenses to continue to be the best alternative when value per dollar spent is examined.

- o The second strategy is being the leader in the services it provides. The library may elect to have computer online services available or call-in reference librarians to do the research for a fee. The emphasis would be on providing superior product/service to clients.

- o The third strategy is one of focus. Being selective is what is offered to whom or with what geographic coverage. A library may be a business or technically oriented library; it may be a periodicals or reference library. It may develop several branches to gain coverage and increase accessibility, or focus on a specific area.

These strategies are not all mutually exclusive, but no organization should blindly attempt to be all things to all people, and well-managed organizations carefully select what strategy they will pursue.

Mr. Turillo compared the library business to the banking industry. Prior to deregulation of the banking industry (which has caused de jure changes as opposed to the de facto changes in information accessibility brought on by computers), the financial industry did not have a solid infrastructure nor was it very efficient. As a result of the major change, there are major upheavals occurring today.

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(1) Michael E. Porter, Competitive Strategy: Techniques for Analyzing Industries and Competition, (New York, N.Y. : Free Press, 1980)

There will be a period of twenty years of major changes. And it is possible that the banking industry, or the library, as we know them today will not survive. But out of this change will come a better financial system and better information access. Bankers and librarians share many of the same frustrations. Both are organizations that came from an understanding of who they were, what their role was, who their clients were, and what was expected of them. All of this has changed "overnight". Both industries are struggling to define their new identity, and both are trying to anticipate the future.

As for the mechanics of preparing a first plan, a library should define its objectives at the outset. A planning group should be formed and include not only top management, but also colleagues who have legitimate responsibilities within the library. Through a set of organized work sessions, this group will develop the strategies and action steps necessary to achieve the objectives set forth.

Architecturally, a plan will vary little from one library to another. First, a broad statement of purpose and goals should be developed, called a mission statement. It should be short, about 50 words. From this mission statement, more specific goals will be developed leading to finite, measurable objectives. Once developed, the specific objectives can be organized into four chapters or categories.

- The first should concentrate on current operations within the library to identify where improvements can be made. Given that the library has already made a significant investment in facilities, equipment, and personnel, the first effort should be to maximize the return on investments.

- The second chapter focuses on new products or services which can be delivered and the method of delivering these services. As the evolution of an information-based society continues, how a library will identify and meet the consumer's needs for information and remain competitive is the topic of the second chapter.

- The third chapter will address market coverage, i.e., how a library will define its market and tailor its services to focus on these needs. Should a library establish branches geographically or organize around functional areas such as engineering, art history, fiction, reference, etc.?

- In the fourth chapter, the library must address what systems are needed, what facilities, and what people are required to support the objectives of the previous three steps. One might ask if this step should not be first. When implementing it, it will be performed first, but

until the other chapters are complete, chapter four cannot be written. Not unlike the foundation for a house, it may be the first part built, but the architect cannot specify how to build the foundation until he knows whether it is a two-story or ten-story building, and whether it will be made of stone or wood. Therefore, before a library designs its systems, commits itself to equipment or facilities, or hires staff, the first three chapters must be written.

To write these four chapters and develop the strategies requires a detailed assessment of internal factors within the organization (strengths, weaknesses, etc.) as well as an analysis of the external environment (current position, competition, trends, etc.). Although the individual library often cannot change the external environment, it must be aware of its current position and how changes will affect it.

There are four basic needs relevant to the gathering of information and the use of it. The first is the user's need to inquire. Users have many questions. How can a library efficiently address them? The second need is to be able to ask "what if" questions and gain an understanding of alternatives. This is the fact-finding or research function of a library. Can it be streamlined by Nexis, Lexis, or Compustat? The third need is to transact. In the case of a library it is the actual access to the information from the moment of check-out of a book, the making of copies of articles, or the downloading of a database to a user's file. These four needs and how to satisfy them in a library environment must be considered. The mission of the library is, after all, to satisfy the customer's information needs.

Mr. Turillo concluded by suggesting that librarians continue to monitor what is going on today, anticipate tomorrow and consistently identify the changes occurring in order to define the most appropriate response(s) in a pro-active rather than reactive fashion.

Report on a CLR Sponsored Meeting on the Economics of Research Libraries

Dr. Martin M. Cummings, a consultant with CLR and a former director of the National Library of Medicine, reported on the latest meeting sponsored by CLR on the economics of research libraries. He has been working with CLR on a series of seminars aimed at achieving a better understanding of library economics for strategic planning and long-range forecasting, and has been looking at the impact of new technology on library costs.

Dr. Cummings presented highlights from the paper "The Need to Study Library Economics," which he prepared for the CLR sponsored meeting. NAC obtained Dr. Cummings' permission to include his paper on the following pages.

The Need to Study Library Economics

Martin M. Cummings

As the United States moved from an industrial to an information-based economy, the proportion of the work force engaged in the information sector rose from approximately 33 percent in 1950 to 50 percent in 1975.[1] The same phenomenon is occurring in other industrial countries. Research libraries have been involved in the rapid growth of the information industry, both as consumers of publications and disseminators of information. They are essential to the research and educational enterprises of the nation. Yet we know little about the economics of research libraries or the relationship of budget decisions to the needs of users. Even less is known about the implications of these decisions for the research and scholarly enterprise as a whole.

The total annual expenditures for all (117) ARL libraries now exceed $1 billion, with an mean university library expenditure of approximately $8 million.[2] During the past 15 years, the actual dollars spent by ARL university libraries have increased by 200 percent, rising from $212 million in 1969 to $637 million in 1983. In constant dollars the increase is only 19 percent, from $250 million to $297 million. Expenditures of this magnitude

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[1]Marc V. Porat et al., The Information Economy, O.T. Special Publication 77-12 (Washington, D.C.: Department of Commerce, 1977).

[2]Association of Research Libraries, ARL Statistics, 1982-83: A Compilation of Statistics from the One Hundred and Seventeen Members of the Association of Research Libraries, comp. Carol A. Mandel and Alexander Lichtenstein (Washington, D.C.: ARL, 1984).

require careful analysis to determine real budget needs and assess cost benefits. It is also important to examine library expenditures in the context of national needs for education, science, scholarship, and economic productivity.

Library Statistics

There are several sources of academic and research library statistics and reports on their compilation.[3] However, few include any cost data that are reliable or useful for budget planning or forecasting. Some libraries have considered library statistics a necessary chore for membership in selective professional associations rather than as a tool for management decisions. More recently, however, librarians have begun to use statistics to make budget comparisons with institutions of similar size and characteristics.

Current Trends in Library Expenditures

A recent NCES study of college and university library statistics reveals that almost $2 billion were spent in 1982. Whereas the total operating expenditures of academic libraries increased by 30.4 percent between academic years 1978-79 and 1981-82, the inflation rate rose by 37.3 percent

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[3]Mary Jo Lynch, ed., Library Data Collection Handbook (Chicago: American Library Association, 1982); Association of Research Libraries, ARL Statistics 1981-82, comp. Carol A. Mandel (Washington, D.C., 1983); Frank Schick, "Developments in Library Statistical Activities," in The Bowker Annual, 27th ed. (New York: R.R. Bowker, 1982), 309-12; Association of Research Libraries, Cumulated ARL University Library Statistics, 1962-63 Through 1978-79, comp. Kendon Stubbs and David Buxton (Washington, D.C., 1981); Sandy Whiteley, "Sources of Statistics on Academic Libraries," College & Research Library News 44 (July - August 1983): 223-25.

for the same period.4 Expenditures for salaries increased by 30 percent, while expenditures for fringe benefits rose by 47.8 percent. During this period, total receipts from the federal government decreased by 23.2 percent. Although periodical collections increased modestly (3 percent) during this period, acquisitions of book volumes and book titles decreased by 9.1 percent and 11.6 percent, respectively. This downward trend has been under way since 1972-73.

Although circulation of library materials remained unchanged during this period, reference transactions increased by 64.8 percent, loans to other libraries increased by 34.1 percent, and loans from other libraries increased by 18 percent. Salaries account for more than half of research libraries' expenditures, and accompanying fringe benefits increased by 48 percent during the four-year period.

Stimulated by the CLR Economics Seminar, the Association of Research Libraries completed successfully a supplementary statistics questionnaire that provided new data on the costs of library operations and services. Thirteen academic libraries reported on the following new data elements:

1. Costs of personnel categorized by professional, non-professional, and other staff performing technical services, public services, collection development, and administration.
2. Costs of monographic volumes purchased.

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[4]"Three Years of Change in College and University Libraries, 1978-79 to 1981-82," National Center for Education Statistics Bulletin (February 1984).

3. Costs of automation, including:
   a. bibliographic utility charges for products and services
   b. database searching charges
   c. hardware expenditures
   d. software expenditures.
4. Costs of external and reserve circulations.
5. Costs of reference transactions and directional transactions.
6. Number of instructional faculty who used the library.

The response by the institutions participating in this data collection test was judged to be of sufficient importance to justify adding these data elements to those already included in the annual survey of all ARL members.[5] This will provide a comprehensive profile of functional costs as well as the expenditures of major research libraries in our nation.

One would expect libraries that join resource-sharing consortia to significantly decrease the rate of collection building. So far, there is little evidence that this is occurring, even though most librarians and university officers realize that the present rate of growth must decline.

The ARL Statistics for 1982-83, compiled from questionnaires returned by member libraries, revealed that the 117 libraries held 209,900,000 volumes.6 They expended $636,500,000, or approximately $3.00 per volume

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[5]Association of Research Libraries, ARL Statistics, 1982-83.

6Kendon L. Stubbs, Introduction to ARL Statistics 1982-83 (Washington, D.C.: Association of Research Libraries, 1984).

held. Previous ARL studies revealed a high correlation between volumes held and materials acquired, personnel, and expenditures. The more volumes held, the more the research library acquires, the larger the staff, and the greater the total expenditures. Expenditures per volume held appears to be a useful index of research library costs.

Libraries' costs have risen significantly during the past two decades. ARL member library expenditures increased by 200 percent since 1969, or, when measured in constant dollars, 19 percent. Although the rate of library expenditures has slowed in recent years, it still exceeds the rate of growth for university educational programs. Yet there is too little reliable information relating library performance to the research and teaching process.

Allocation of Costs for Research or Educational Services

It is important to know whether a research library really serves the research enterprise. Some libraries receive funds from granting agencies for this purpose. In 1963, Stanford University undertook a study to determine what fraction of the total cost of the Stanford University library system could be charged to each of the major user groups. Five separate cost elements were identified for allocation to each user group: 1) materials costs, 2) binding costs, 3) salaries and benefits, 4) administration, and 5) operating and maintenance costs and building and equipment depreciation. Based on the methods of cost allocation used, the following total costs of providing service were determined for each user group:

Table 2

User Group	Cost
Undergraduate students	$ 401,728
Graduate students	1,138,112
Faculty and staff	947,624
Non-Stanford users	116,569
TOTAL	$2,604,003

The ratio of library costs for graduate students to the costs for undergraduates was 2.8:1. The ratio of costs for faculty and staff to costs for undergraduates was 2.4:1. The combined library costs for graduate students and faculty and staff were five times greater than the costs for undergraduates. These ratios indicate that an academic library provides more service for research and scholarship than for undergraduate education.

A similar study performed at Columbia University in 1971 revealed that 64 percent of the libraries' budget was used to provide research services, versus 36 percent for instructional services.[7] In addition, the study revealed that 14 percent of graduate students accounted for 37 percent of the reserve books checked out, and 25 percent of these users borrowed 53 percent of all non-reserve books circulated. Overall, roughly 40 percent of the users accounted for 70 percent of circulation of all types of materials. These

[7]Ellis Mount and Paul Fasana, "An Approach to the Measurement of Use and Cost of a Large Academic Research Library System: A Report of a Study Done at Columbia University Libraries," College & Research Libraries (May 1972): 199-211.

statistics are important for long-range planning as well as for those who are concerned with the immediate need to estimate costs such as overhead expenditures for grants and contracts. Assuming these observations to be valid, a major proportion of the aggregated budgets of academic libraries supports the national research enterprise.

The collection of library cost data has been inhibited by some librarians' fears that the analysis of findings might lead to further decreases in their budgets. They also were concerned that many of the hidden costs such as fringe benefits, space maintenance, and administrative overhead would be added to the library budget and thereby compete with allocations for direct costs such as labor and materials. More recently, leading librarians have recognized that library cost data may not be embarrassing but could, in fact, help support their requirements for increased budgets. Some also have recognized that intelligent decision making requires cost data to assist in monitoring current performance and forecasting future trends.

Rising library costs and the funding of libraries are matters of real concern to institutional officials. University officials, library directors, faculty, and students are all affected by changes in library costs and services. Rapid changes in the provision of library services have occurred as a result of new computer and communications technologies. The evolution of multi-institutional arrangements for resource sharing and the successful development of new bibliographic utilities also have changed the ways in which libraries acquire materials, process them, and make them available to users. There have been few attempts to measure the cost efficiencies and cost benefits resulting from these new cooperative arrangements.

The past decade has seen the development of a significant number of regional and several national library networks and consortia designed to improve library services. Whereas most of these multi-institutional arrangements involve bibliographic systems as the principal common feature, some also engage in interlibrary lending programs and selection and acquisition activities, as well as the development of other specialized cooperative ventures. These new arrangements take many forms and have a diversity of sponsorship and membership.

The principal effect of new bibliographic utilities has been to reduce the need for local cataloging. This effect has allowed library directors to shift personnel from this task to other library services. The cost of original cataloging must still be borne by someone, but the great redundancy in cataloging the same items in many places surely represents a national cost saving. Centralized cataloging in the health sciences by the National Library of Medicine has been estimated to save the nation approximately $4 million annually.[8]

Despite problems of ownership and pricing, it is clear that most libraries will be forced to shift from building collections to new access arrangements and resource sharing. Increasing wages and static productivity will force reallocation of resources to provide more efficient and responsive service to patron demands. This service will inevitably involve more automation of technical processes, greater use of bibliographic utilities, and increased reliance on multi-institutional or national networks. The greater

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[8]Joseph Leiter, Memorandum to Director, National Library of Medicine.

use of these services will create more pressure to recover costs through user fees. New systems of cost accounting and measurements of cost/performance will be required to maintain the administrative apparatus for fiscal responsibility and budget planning.

Experience to date suggests that the shift to online, computer-based systems linked on a national scale will have problems similar to those found in existing consortia; namely, the administrative, organizational, and economic issues are more difficult than the technical problems. In particular, the economic problems that stimulated the creation of these arrangements remain. Those programs that have little outside subsidy are unstable. The major incentives to maintain these arrangements are the computerized catalog systems that have emerged as a significant advance in library operations.

Group Discussion

The attendees were allotted time after each speaker to ask questions and to raise issues for discussion. Members were concerned about how libraries and library networks can have a positive impact on the information economy and how the information economy can have a positive impact on libraries. What kind of monitoring activities are needed to anticipate change and capitalize on it? Is the changing shape of the information economy a survival issue for libraries? Who is the competition?

The definition of the competition that emerged included financial services, American Telephone & Telegraph, bookstores, subscription agencies, information brokers, and 300 number services accessed via the telephone. The definition of a library included for profit, non-profit, and government libraries, each type having a different mission and different end-users, but all having a service orientation and the mission to make information available to the user, whether a member of Congress or a student. Access to information was viewed as the driving force behind library service.

Now that competitors are making money selling information, how do libraries compete? If libraries want to compete, they need to provide information fast. The Network Advisory Committee (NAC) members agreed that NAC needs to focus on how best to allocate resources so that libraries can compete effectively in delivering information. Another important function for libraries is the preservation of a country's cultural and literary heritage. The NAC members felt that recreational services should be viewed as a secondary library function. They viewed the primary mission of academic libraries as serving the instructional and educational process of the parent institution, while the public library's mission was perceived to be that of contributing to the process of making citizens informed.

A number of issues were touched on briefly: the impact of micros on libraries, the constraints of public funding, and the fact that many libraries are viewed as an overhead expense rather than a cost center. Would a change in clientele and in the complement of services offered necessarily be bad? Are there opportunities to be seized? Is there need to worry about duplication of effort by the competition?

The group asked to hear more about the Lake Arrowhead Conference. Brett Butler, Toni Carbo Bearman and Ronald F. Miller attended the conference and provided the following information for NAC members.

They described the background of participants at the Lake Arrowhead Conference, the purpose of the sessions, and their perception of the benefits resulting from the conference. Conferees included librarians, consulting economists, general business consultants, employees in high tech firms, elected officials, and representatives of publishers, information services, and community groups.

The purpose of the Arrowhead conference was to foster the use of information, consider public policy implications, explore appropriate information policy responses, discuss how best to measure the value of information including the impact on education, industry, and productivity, determine how to maximize libraries' role in the information economy, and identify what data are needed by libraries for decision making. Two benefits of the conference were that some of the participants from other professions were brought "into the fold" and that the proceedings could be used to provide background information in the political arena if library funding were threatened.

The NAC members agreed with the concerns of the Arrowhead conference. They were particularly concerned about the absence of data upon which to base a better understanding of the social and economic trends that are shaping the economy today and that will continue to transform the economy tomorrow. Do data exist and, if not, can they be readily collected? "Ball park" data would be sufficient for NAC purposes. The group recognized that such data could be used for policy setting as well as for a functional analysis of an internal library organization.

Toni Carbo Bearman had prepared a few notes on the availability of data sources and a few numbers, such as the number of public libraries in the United States and the total expenditures in that year by public libraries. The NAC members agreed that while the National Center for Education Statistics (NCES) was a good source, its funding had been cut, thus inhibiting data collection on a timely and repetitive basis. A NAC statistics subcommittee was formed to explore data sources and report at the next NAC meeting.

After considerable discussion, NAC concluded that they need to: 1) take a more active interest in making use of quantitative measures of the information economy; 2) collect, supply and maintain useful data that complement and supplement national statistics; 3) measure the impact of the information economy and shifts as they occur; and 4) support quantitative research in order to understand how libraries are affected by the emergence of the information economy.

SUMMARY OF BUSINESS SESSION

The business portion of the Network Advisory Committee (NAC) meeting on November 16, 1984 began with a report from the membership subcommittee chair, Toni Carbo Bearman. Mrs. Bearman reported on an application for membership from the Universal Serials & Book Exchange, Inc. (USBE). After reviewing the material provided, the membership subcommittee (Toni Carbo Bearman, Brett Butler, Mary Ellen Jacob, Ronald F. Miller, Sandra K. Paul and Henriette D. Avram (ex officio)) recommended that USBE's application for membership be accepted.

Four NAC member organizations, the Bibliographical Center for Research (BCR), the Minnesota Interlibrary Telecommunications Exchange (MINITEX), the National Agricultural Library (NAL) and the Special Libraries Association (SLA) had selected new representatives to NAC. They are David H. Brunell, BCR; William DeJohn, MINITEX; Pamela Q. Andre, NAL; and Bette Dillehay, A.H. Robins Company for SLA. The NAC members welcomed the newcomers.

NAC also acted on the following items of old and new business:

(1) Mrs. Avram reported on the status of a proposal prepared by Ward Shaw to investigate expert systems and the possible impact of such systems on libraries. Mr. Shaw was asked to make a few modifications and send the revised version to the secretariat after the November NAC meeting for possible submission to the Council on Library Resources for funding of a study.

(2) Mrs. Bearman distributed a first draft of a list containing public sector/private sector cooperative projects, compiled in response to the NAC recommendations in Network Planning Paper no. 8. The National Commission on Libraries and Information Science (NCLIS) is to prepare an inventory of past and current projects that have demonstrated the effectiveness and efficiency of public and private sector interaction. The list was sent to all NAC members in December 1984 for comments and additions, to be sent to Diane Rafferty at NCLIS by February 1, 1985.

(3) Mrs. Bearman distributed the NCLIS factsheet of "ball park" figures on the total number of public libraries in the United States. This factsheet was prepared in 1984 by NCLIS as a model that could be used to develop a factsheet of "ball park" figures for all categories of libraries in the United States. A revised version of the public library statistics was sent to all NAC members in December 1984 for comments. Mrs. Avram appointed a statistics subcommittee, Toni Carbo Bearman, Carol C. Henderson, and Mrs. Avram. The subcommittee is to identify that portion of the information economy that libraries represent and provide "ball park" figures for it.

(4) Mrs. Bearman distributed chapter IV, "The Trend Toward Cooperative Action," of Toward a National Program for Library and Information Services: Goals for Action (1975) and also a second draft revision of objective 7 and asked all NAC members to review the new objective 7, which replaces objectives 7 and 8 as well as chapter IV of the NCLIS program document and, in their capacity as network experts, to be prepared to participate in a discussion at the next NAC meeting.

(5) Mrs. Bearman distributed the executive summary and recommendations of the NCLIS Special Task Force report on "The Role of the Special Library in Networks and Cooperatives," and informed the NAC members on the work being done at NCLIS. Mrs. Avram suggested that resources represented by NAC organizations and NCLIS be pooled and that the two organizations work together toward solutions. The program planning subcommittee for the May 1985 NAC meeting will consider including a discussion of related legal issues in that meeting.

(6) Mrs. Avram suggested that the topic of the next NAC meeting be the identification of key issues in networking in order to assist NCLIS in revising the networking section of its program document. The committee agreed with the recommendation and Mrs. Avram named C. James Schmidt (chair), Toni Carbo Bearman, Betty Davis, Charles T. Payne, Louella V. Wetherbee, and Henriette D. Avram (ex officio) as the program planning subcommittee for the May meeting.

LIBRARY OF CONGRESS NETWORK ADVISORY COMMITTEE
Chair: Henriette D. Avram

Meeting, November 14-16, 1984
Gramercy Hotel
1616 Rhode Island Avenue, N.W.

THE INFORMATION ECONOMY IN THE U.S.:
ITS EFFECT ON LIBRARIES AND LIBRARY NETWORKS

S C H E D U L E

Wednesday, Nov. 14	Event	Room
5:00 - 6:00 pm	Registration/Reception	South Scott
6:00 - 7:15 pm	DINNER	South Scott
7:15 - 7:30 pm	Chairman's Welcome Henriette D. Avram	
	Introduction to Program Session by Barbara M. Robinson, chairman, program planning subcommittee	
7:30 - 8:00 pm	Introduction of speaker Ronald F. Miller, Executive Director, CLASS Setting the stage	
8:00 - 9:30 pm	Introduction of speaker Kenneth W. Leeson, Special Advisor for Policy, U.S. State Department Tutorial on information economy (IE) definitions, etc.	
9:30 -10:00 pm	Guided discussion (Full committee)	
10:00 pm	ADJOURN	

Thursday, Nov. 15	Event	Room
8:15 - 9:00 am	Continental Breakfast	South Scott
9:00 -10:00 am	Introduction of speaker Sherman Robinson, Associate Professor, Dept. of Agricultural and Resource Economics, University of California, Berkeley Tools and techniques i.e., strengths and limitations of models	
10:00-10:30	Guided discussion (Full committee)	
10:30-10:45 am	BREAK	
10:45-11:15 am	Introduction of speaker Brett Butler, Information Access Corporation Report on the IIA study of the information industry	
11:15-11:45 am	Guided discussion (Full committee)	
11:45- 1:00 pm	LUNCH	North Scott
1:00 - 2:00 pm	Introduction of speaker Michael J. Turillo, Jr. Principal Peat, Marwick, Mitchell & Co. Concrete example of using tools and techniques i.e., strategic planning, what is it, what will it do?	South Scott
2:00 - 2:30 pm	Guided discussion (Full committee)	
2:30 - 2:45 pm	Introduction of speaker Dr. Martin Cummings, Consultant Council on Library Resources Report on the CLR sponsored meeting on the economics of research libraries	
2:45 - 3:00 pm	Guided discussion (Full committee)	
3:00 - 3:15 pm	BREAK	

Thursday, Nov. 15	Event	Room
3:15 - 4:00 pm	Working group assignments and break-up into individual groups	North Scott South Scott
4:00 - 5:00 pm	Working group leaders' report to committee as a whole	
5:00 - 5:30 pm	Wrap up comments with speakers	
5:30 pm	ADJOURN	

Friday, Nov. 16	Event	Room
8:15 - 9:00 am	Continental Breakfast	South Scott
9:00 -10:15 am	Committee as a whole What are the next steps? Commission a paper? Need to learn more about IE? IE in the library world - the next NAC meeting topic?	
10:15-10:30 am	BREAK	
10:30-11:00 am	Continuation of above	
11:00-11:45 am	Business meeting old business report by Henriette D. Avram new business report by Toni Bearman on the NCLIS program document other new business next meeting	
11:45 - Noon	Concluding remarks by Chair of the NAC	
Noon	ADJOURN	